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Analyzing the Effects of Resource Relatedness on Strategic Alliances Performance

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***Abstract*—**Very few studies have examined performance implications of strategic alliance announcements in the information technologies industry from a resource-based view. Furthermore, none of these studies have investigated resource congruence and alliance motive as potential sources of abnormal firm performance. This paper extends upon current resource-based literature to discover and explore linkages between these concepts and the practical performance of strategic alliances. This study finds that strategic alliance announcements have provided overall abnormal positive returns, and that marketing alliances with marketing resource incongruence have also contributed to significant firm performance.

***Keywords*—**Event study methodology, resource-based theory, resource relatedness, strategic alliance.

I. Introduction

ESTABLISHING strategic alliances is a critical and popular strategy for obtaining vital resources for most firms, particularly those that operate within a highly competitive environment [16] such as information technology industries. Not only are they formed to simply combine resources, but their existences are based on dynamism, and the prospect of creating and exploit new opportunities for collaboration and mutual learning [10]. In addition, strategic alliances offer firms the opportunity to conserve valuable resources by sharing overhead costs between firms, as well as to better able to enhance the reliability of their business operations, particularly in supply chain strategic alliance [16].

Previous studies suggested that alliance benefits include cost synergies, reduced product development expenses, improving technological capabilities, improved value chain reliability, risk sharing, access to financial capital, access to complementary resources, improved capacity for rapid learning and information transfer [16]. Access to such benefits provide firms with a cushion with which to weather business downturns and other setbacks, ensuring predictable returns from the application of their resources [9].

However, in spite of their attractiveness, cooperative relationships with other organization can be problematic [9]. Strategic alliances are inherently incomplete contracts because partners cannot anticipate all future contingencies at the time of writing the contracts [7]. The flexibility in business arrangements allowed in strategic alliances mean that property rights associated with alliance output and future income are not well defined. This places a significant level of implicit risk over the alliance process. Therefore, choice of alliance partner is crucial to firm success and the improvement of firm performance. One question that inevitably arises from this area of study is: what form of strategic alliance will contribute greatest to firm growth? It is then of critical importance to better assessing the impact of alliance partner upon the performance of each firm.

In response to this question, significant research in the area of strategic management and organizational sciences have attempted to understand the underlying drivers of more effective strategic alliances and better firm performance in general. Unfortunately, the extant research investigating the relationship between strategic alliance and organizational performance has yield inconclusive results. Some researchers have insisted that alliances between two firms that are related, similar, and specialized will bring about the greatest growth to the company [5], [17], [19], [22]. In contrast, others have developed ideas that alliances between two firms that are unrelated, dissimilar, and diversified, will bring about greater value creation to the combined entity [15], [16], [21].

To fill this gap, this study attempt to develop research hypotheses which are broad enough to accommodating both notions of similarity and dissimilarity from resource-based theory. Then, the hypotheses will be tested with strategic alliance announcements of U.S. listed companies in information technology industries from the 1st of January 2000 to the 3oth of June 2007. Strategic alliance formation is prevalent in high-technology industries such as information technology. In an industry where there is a high level of competition, there is a greater rate of alliance formation [9] as firms are forced to adapt to rapid technological change before any others operating within the industry in order to capitalize from the first mover's advantage. Rothaermel and Boeker [20] argue that each firm possesses the intense desire to access and secure resources critical in achieving and maintaining competitive advantage. For these reasons, empirical evidence tends to suggest that strategic alliance formation rates within emerging markets tend to exceed those of growth-stage markets [9].

II. Theoretical Background

A. Theoretical Background

The resource-based theory (RBV) is one of the most widely accepted theoretical perspectives in the strategic management field and also one of the most popular methods for explaining firm behavior and performance over time [18]. Firm resources

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may be heterogeneous and immobile between firms, and those that are valuable, rare, inimitable and non-substitutable may enable the organization to improve its efficiency and create a competitive advantage [3]. While value and rarity create competitive advantage; substitution, mobility, and inimitability threaten firms by diluting competitive advantage. That advantage can be sustained over longer time periods to the extent that the firm is able to protect against resource imitation, transfer, or substitution [1], [13].

Following the resource-based view of the firm, many strategy researchers have used resource allocation patterns as an effective basis for indicating underlying strategies that organizations pursue over time [27]. The core aspects of an organization's strategic direction are visible in the resource allocation decisions that top management makes, and hence two firms exhibiting very similar resource allocation patterns as measured a variety of strategically relevant characteristics would be considered strategically similar [19]. Past literature has found that the terms "similarity", "relatedness" and "specialization" have been used interchangeably to describe a similar allocation pattern of resources [12], [17], [19].

The prior literature that has explored the relationship between similarity (or dissimilarity) in resource relatedness and alliance performance can be categorized into three stream: i) similarity increases alliance performance, ii) dissimilarity increase alliance performance, and iii) moderate dissimilarity increase alliance performance. The studies in the first category insist that similarity in firm capabilities, social capital, and status similarity are more likely to form alliances with one another [5]. For example, [22] argued that product-market relatedness between target and bidder firms in acquisition strategies is a desirable characteristic that can help post merger performance. Literatures under the second category suggests that "dissimilarity", "unrelatedness", or "diversification" between firms enable partnering firms to gain access to resources not otherwise readily available internally [19], [15]. For example, [21] found that diversification from a technological perspective provided scope for information sharing, which significantly improved the value of the alliance between firms. Studies in the third category insist neither similarity nor dissimilarity is recipes for optimal overall firm performance. Moderate dissimilarity between alliances firms contribute greater to firm performance than a high or low dissimilarity.

B. Hypothesis Development

Since strategic alliances are formed for the purpose of accessing resources not otherwise attainable by a firm [16], agency theory leads us to conceive that strategic alliances are entered by managers in order to act in their own interests. If their interests are significantly congruent with those interests of shareholders through the offering of shares, options, and bonuses, they will also act in the best interests of the firm's shareholders [2]. With this in mind then, it would be conceivable that strategic alliances will have a positive impact on firm value. Past research has already shown this is significantly true [4].

H1: Strategic alliances in the IT industry will positively affect overall firm performance.

Because there has been significant debate on the dilemma of specialization or diversification of resources to achieve optimal firm performance, this paper aimed to provide further insight into this area. With this understanding, strong opinions could be drawn either way, but because strategic alliances are essentially forged in an effort to obtain access and control of rare and valuable resources the firm otherwise does not possess [3], [24], it would be essential that the resources and knowledge capabilities between firms would need to be sufficiently different in order for competitive advantage to be achieved. Hence we insist:

H2a: Capital unrelatedness will positively affect firm performance of strategic alliances in the IT industry.

H2b: Marketing unrelatedness positively affects firm performance of strategic alliances in the IT industry.

H2c: R&D unrelatedness positively affects firm performance of strategic alliances in the IT industry.

H2d: Managerial unrelatedness positively affects firm performance of strategic alliances in the IT industry.

III. Research Methodology

The event-study methodology is chosen for two primary reasons: restricted by timing constraints we were limited to publicly available data, and it is exceedingly difficult to ascertain the impact of strategic alliance performance by accounting measures since any one firm would undertake many strategic investment decisions in any one financial period.

A. Data Collection

News articles were collected from the Factiva news database from several distinguished news wire feed services including PR Newswire, Prime Newswire, Business Wire, Reuters News, and Dow Jones professional Investor Report. The use of these premium news wires as shown in previous studies [4], [14], [16] allows us to find timely and accurate information on each strategic alliance announcement. The subject matter of the search was set to "Joint Ventures", which encompasses all articles under the domain of inter-firm collaborations.

In line with our broad definition of information technology, three industrial categories chosen in the query included "Computers and Electronics", "Internet and Online Services", and "Telecommunications". The search was run over all regions, and was run for the English language.

United States stock exchanges were chosen because they possess the deepest capital markets in the world. In accordance with the Fama's [11] analysis of the major US stock exchanges with respect to market efficiency, the three largest US stock exchanges, that is, the New York Stock Exchange (NYSE), the NASDAQ, and the American Stock and Options Exchange (AMEX) were chosen as a basis from which the firms mentioned in the articles needed to be listed.

With these search settings an initial search result of 4,941 articles was achieved. The first filter applied was to ensure that each article detailed the announcement of a strategic alliance between two firms, each of whom was listed on at least one of

the three stock exchanges. This filter resulted in just 871 announcements. Of these transactions, only those that providing sufficient detail on each firm in the transaction passed through the second filter. These details include the firm name, the company tick code, the company exchange code, the date of announcement, and the type of alliance. This left a total of 612 announcements.

Of these articles, confounding events, such as profit figure announcements, dividend announcements, announcements of CEO changes, mergers and acquisitions announcements, and other strategic alliance announcements, occurring to either of the companies within a period of within 1 days prior, and 1 days following the announcement of the strategic alliance formation [16] was removed from the pool of results [8]. This left just 352 announcements. Of those that were left, we removed observations that violated our strict definition of strategic alliances, thus 305 strategic alliances remained.

It was initially decided that strategic alliance announcements would be collected over a period of 7.5 years, spanning from the 1st of January 2000 to the 30th of June 2007, in line with previous studies in high-technology industries [16], [20], [26]. However, it was clear that the announcements listed from the 2000-2001 period were significantly different from the rest of the sample. A new period was later set for the period from January 2002 up to and including June 2007. Of the 305 strategic alliance announcements remaining, only 162 announcements were from the 2002-2007 period. Of those announcements that were left, more than half of the sample did not provide accurate expenditure information, which meant that only 64 transactions passed through this data collection stage. Table I shows the data filtering processes.

TABLE I
DATA FILTERING PROCESSES

Steps	Items Remaining
Initial Search	4,941
Both parties listed in stock exchange	871
Sufficient article information	612
Did not have confounding events	352
Only strategic alliance	305
Only those in economically stable period	162
SEC reporting (enough expenditure information)	64

B. Event Study Methodology

The event study methodology has been widely used as an empirical indicator for investigating the success of interorganizational relationships in previous literature [4], [7], [14], [16]. The fundamental purpose of an event study is to investigate the variables determining our dependent variable, which is the Cumulative Abnormal Return, or CAR – calculated as the sum of the returns made from owning the stock price above the normal stock price during the event window period. A three-day event window was chosen which spans one day before the announcement date to one day after the announcement day.

The market model is defined as:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

where, $R_{i,t}$ = rate of return of stock for the firm i on day t

$R_{m,t}$ = rate of return on the market portfolio on day t

α_i, β_i = are market model intercept and slope parameters for firm i

$\varepsilon_{i,t}$ = disturbance term for stock i on day t

The market model is utilized to forecast the abnormal return. Because NASDAQ-listed firms are in general believed to be smaller, high-technology firms who are far more responsive to market changes, corresponding daily returns of S&P 500 index were collected for AMEX and NYSE listed firms, while the NASDAQ composite index was used as a market measure for those stocks listed on the NASDAQ. The S&P 500 is a capitalization-weighted index which represents the price trend movements on a broad cross-section of the top 500 publicly traded companies in the U.S. market. Although the information technology has somewhat matured in recent years, it still exhibits signs of a high-growth market dependent upon the existence of an opportune environment, and the use of a separate index allows for better forecasting of the information technology industry over the last seven years. This methodology is consistent with that of [16].

The abnormal returns (ARs) are objectively measure changes to firm value above normal market movements over the event period. If the strategic alliance announcement has been value adding to either firm, it would be expected the stock price to react to the extent that the returns made during the period would exceed that of a clean period. AR was calculated as the residual earnings from the market model, which estimates a company's stock returns. We use the market model provided in Equation (1) to estimate company-specific parameters over a 200 trading day period. This estimation window begins 210 trading days before (t = -210) and ends 10 days before (t = -10) the announcement date (t = 0). This is in line with previous studies [7],[16].

The excess return for the common stock is calculated as follows:

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (2)$$

The event study methodology assumes that abnormal returns are the result of the announcement by the firm, and not the event of some other random event within the same window of analysis [23], hence why we controlled for confounding announcements during the data collection stage. The ARs form the basis for the evaluation of the stock market reactions to the announcement.

To capture the price effect of announcements, a 3-day event window was used. A longer event window would increase the chance of stock prices being affected by confounding events [25]. We use a short 3 day event window as it may reduce potential noise due to volatility and newness of the

E-Commerce sector [16]. In addition, our measurements are being used purely as a relative measure of one transaction against other transactions, so small returns made outside of this period would not reflect a significant difference in results reported [4].

The variances for abnormal returns are calculated by the formula:

$$\mathrm{var}(AR_{it}) = \left(s_i^2 \left[1 + \frac{1}{T_i} + \frac{(R_{m,t} - \bar{R}_m)^2}{\sum_{\tau}^{T_i} (R_{m,\tau} - \bar{R}_m)^2} \right] \right) \quad (3)$$

where $s_i^2 =$ residual return variance from the estimation of market model

$\bar{R}_m =$ mean market return over the prediction interval

$T_i =$ number of days in estimation interval (in our case, 120)

$\tau_i =$ observation within the event window

$t_i =$ the day in the estimation interval

The standard error on any given day in the estimated interval is a function of the mean market return for that day. The standard errors of the abnormal returns are larger where there is a substantial gap between market return and the expected return [23], hence our selection of a long 250 trading day estimation window.

The standardized abnormal return can be cumulated over the event window t= [-1, 0, +1], the CAR and var (CAR) can be computed as follows: (where τ=1)

$$CAR_{i,t} = \sum_{j=-t}^{t} AR_{i,j} \quad (4)$$

$$\mathrm{var}(CAR_{i,t}) = \sum_{j=-t}^{t} \mathrm{var}(AR_{i,t}) \quad (5)$$

From these equations, we calculate the average CAR across all firms and the variance of CAR:

$$\overline{CAR}_t = \frac{1}{N} \sum_{i=1}^{N} CAR_{i,t} \quad (6)$$

$$\mathrm{var}(\overline{CAR}_t) = \frac{1}{N^2} \sum_{i=1}^{N} \mathrm{var}(CAR_{i,t}) \quad (7)$$

The t-statistic was used to examine whether the mean CAR over the event period differed significantly between groups:

$$t = \frac{\overline{CAR}_1 - \overline{CAR}_2}{\sqrt{\frac{\mathrm{var}(\overline{CAR}_1)}{N_1} + \frac{\mathrm{var}(\overline{CAR}_2)}{N_2}}} \quad (8)$$

C. Resource Relatedness Measure and Classification

We constructed a measure of relatedness between the four resource groups; capital resource, market resource, R&D resource, and managerial resource. We utilized an intensity ratio which is a ratio based on spending on each functional area divided by net revenues at the end of the previous fiscal year before the strategic alliance announcement. The intensity ratio measure for specific functional areas is used as a proxy to determine respective resource relatedness between alliance parties. For example, R&D intensity is measured using equation (9). We measured each resource relatedness variable by taking the absolute difference of respective intensities between alliance parties. For example, R&D relatedness can be measured using formula (10). This methodology has been used in numerous previous research topics involving organizational relatedness performance implications [6, 12].

$$\text{R\&D intensity} = \text{R\&D expenditure} / \text{total revenue} \quad (9)$$

$$\text{R\&D relatedness} = |\text{R\&D intensity}_1 - \text{R\&D intensity}_2 \quad (10)$$

The clustering technique was employed across each of the relatedness variables, and the mean for each cluster was calculated to find a "high relatedness" and "low relatedness" cluster. The high relatedness cluster was found to have a significantly higher relatedness mean than that of the low relatedness cluster. We used clustering analysis on each of the individual relatedness variables, and then once again on all the relatedness variables together. By performing a cluster analysis on a relatedness measure, we were able to segregate the data into two camps, similarity and dissimilarity.

IV. Results and Discussion

A. Analysis Results

Not surprisingly, it was found that strategic alliances overall contribute to firm value. The average cumulative average return found here was 2.23%, approximately 0.5% more than that found in [4]. This could be due to the fact that an overwhelming majority of firms being analyzed here are from the high-technology sector, and hence the opportunity or access to resources here is far more important and valuable than in mature markets [5]. A simple t-test was carried out over the result set of CARs obtained. The resulting t-value suggests a p-value < 0.005 which indicates the statistical significance of this collection of data in verifying that strategic alliances in general create abnormal returns for partnering firms (see Table II).

TABLE II
STRATEGIC ALLIANCE AND CAR

Announcement	Sample No.	CAR	*t*-value	Remarks
Alliance	64	2.23%	2.697	Support H1

Table III shows that transactions of low capital relatedness tend to experience on average higher levels of CAR. This relationship points to the gain in firm value of smaller firms who benefit from the capital investment of much larger firms who may be less agile and able to access rare and valuable knowledge resources. Capital intensity is a predictable measure of a firm's ability to enter into new investment projects, new strategies, and the ability to enhance their production capacity because of their sheer size. Since capital intensity is measures as total assets divided by total sales, it has an inverse relationship with the ROA (Return on Assets) formula. As such, ROA has proven to be a significant indicator of market firm value and firm profitability.

TABLE III
CAPITAL RELATEDNESS AND CAR

Capital Relatedness	Sample No.	CAR	*t*-value	Remarks
Low	45	2.48		
High	19	1.59		
CAR difference		0.89	2.597 (0.005)	Support H2a

Table IV suggest that highly correlated marketing intensities will diminish the CAR yielded. This would be because technologically-focused firms operating within the information technology sector would be entering into alliances with market intensified firms in an effort to access new client bases, customer support lines, and distribution channels [6]. Without this critical access to markets, IT firms would fail to realize the return on their risky yet potentially lucrative returns on investment. Therefore there is sufficient evidence to present the view that marketing resource incongruence contributes to greater cumulative abnormal returns with the announcement of a strategic alliance.

TABLE IV
MARKETING RELATEDNESS AND CAR

Marketing Relatedness	Sample No.	CAR	*t*-value	Remarks
Low	60	4.25		
High	4	2.08		
CAR difference		2.17	3.242	Support H2b

Table V indicates that high relatedness in R&D intensities between partnering firms have added significant value to firms. This suggests that firms entering into alliances in an effort to gain access to rare and inimitable technological resources must themselves possess technological knowledge capability in order to utilize the new found knowledge in an effective manner.

TABLE V
R&D RELATEDNESS AND CAR

R&D Relatedness	Sample No.	CAR	*t*-value	Remarks
Low	47	1.19		
High	17	5.05		
CAR difference		-3.86	-9.818	Not support H2c

Table VI indicates that high administrative and managerial relatedness between firms in a strategic alliance overall tends to contribute to higher CAR. This result, however, is distorted by the fact that only five firms exist on the lower relatedness cluster. It is noteworthy to mention that managerial relatedness can lead to greater control over the access to resources, and is a crucial ingredient in the transfer of knowledge capabilities [17].

TABLE VI
MANAGERIAL RELATEDNESS AND CAR

Managerial Relatedness	Sample No.	CAR	*t*-value	Remarks
Low	59	1.60		
High	5	9.48		
CAR difference		-7.88	-10.612	Not support H2d

B. Discussion

The results of this study have significant contributions to be made in the field of strategic alliances within the information technology sector. Our results have both theoretical and practical implications for researchers and corporate practitioners to utilize in an effective manner. Firstly, we have proven that strategic alliances forged within the information technology sector provide significant value to partnering firms between 2002 and 2007. Secondly, while previous works have argued strongly in regards to resource congruence, relatedness, similarity, and specialization, the results of this paper place some level of doubt over this certainty, at the same time placing doubt over proponents of resource-based theory who have argued the case for resource incongruence, unrelatedness, dissimilarity, and diversification to optimize firm performance. Thirdly, we were able to synthesize the relationship between alliance motive and resource relatedness – and conclude that marketing incongruence between firms acting in a marketing alliance tend to perform better than those firms with more similar resources.

This research has some limitations. Firstly, the event study model makes many unjustified assumptions that are not an accurate representation of reality. It cannot be expected that markets are completely efficient and that market expectations will always, if ever, reflect future performance of the firm as a result of its current investment decisions such as entering into strategic alliances. Secondly, data was collected from secondary SEC filings, which while perhaps more accurate and descriptive than SIC codes, are not necessarily an accurate representation of the firm. The final limitation of this research paper is the number of samples from which we conducted out analysis. Our small sample size of 64 means that the sample data is sensitive to skewing or outliers and hence there is

potential that the results of this study may not be a true or accurate representation of the entire strategic alliance community in the field of information technologies.

V. Conclusion

Strategic alliances within the information technology sector continue to be a critical factor for resource sharing, knowledge capability transfer and competitive advantage for all firms. The aggressively competitive market combined with the high level of innovation prevalent in the industry means that firms are forced to forge alliances with other firms who may have the access to resources they otherwise lack in order to survive. Empirical studies in strategic alliances have been lacking, particularly in the area of resource relatedness. This study recognizes this gap in knowledge and seeks to partially apply some of the resource-based theory to the current information technology environment. While this paper offers some significant contributions to the area of study, there are clearly areas where this research has left untouched, and need to be addressed in future studies.

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